

DAÑOS POR IMPACTO EN VARIEDADES DE MANZANA, PERA Y  
OTROS FRUTOS

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RESUMEN

Se han realizado varios ensayos de resistencia a impactos en diferentes variedades de frutos: manzanas (4 variedades), peras (4 variedades), peras Nashi o asiáticas (4 variedades), melones (2 variedades) melocotones (2 variedades) y aguacates.

Se describe la metodología de los ensayos, así como los resultados y observaciones obtenidas en cada grupo de ensayos. Se compara la respuesta al impacto con la susceptibilidad a la magulladura, el tipo de magulladura y las diferencias varietales y de madurez.

# IMPACT DAMAGE ON SELECTED VARIETIES OF APPLES, PEARS AND OTHER FRUITS.

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**ABSTRACT.**- During the past years, different laboratory impact response studies have been carried out in following fruits: apples (2 varieties), pears (4 varieties), Asian or Nashi pears (4 varieties), melons (2 varieties), peaches (2 varieties) and avocados.

The methodology of the tests is described, as well as the results and observations obtained in each group of tests. Impact response is compared to bruising susceptibility, bruise characteristics (appearance and structural features) and varietal and ripeness differences.

With the laboratory impact testing device we have been able to test different fruit species during the last months. The main objective of these tests has been to know the different impact susceptibility of these fruits to low-energy impacts (4 cm drops of a 50.6 gram spherical mass) as compared to the apple and pear varieties tested in previous years, and presented in another contribution of this same Workshop. Also, correlation between no-damaging-impact parameters and ripening advancement is being searched.

Fruits of melons, peaches, avocados, mango, chirimoja and new varieties of pears (Passa Crassana and Blanquilla) and Starking apples were tested. In some cases, fruits were harvested directly in the field, transported to cold-storage and tested during the storage duration. In some other cases, commercial, no totally ripe fruits were tested during their ripening period, to senescence.

A summary of the tests follows, most of the data remaining still to be analyzed.

## MELONS

Two varieties of "Honey" melons of interest to Spain and Portugal (Piel de Sapo and Blanco) were harvested in the field and tested during 7 weeks of cold storage. Destructive and non-destructive tests were performed in samples of 10 fruits each week.

The tests include:

Impacts with a 115,3 gram spherical mass, 30 mm in diameter, 2 to 20 cm drop height;

static deformation with the same sphere, to 4 mm, at a speed of 10 mm/min;  
puncture with a 0,5 mm diameter cylindrical punching instrument;  
Magness-Taylor penetrometer readings (7,9 mm diameter);  
pure cut of cylindrical probes of the pulp.

The results of these tests have to be correlated to ripening advancement, also determined by a testing panel and by physiological determinations, like acids and sugars.

No bruises were aparent at all with this level of impact in these two varieties of melons.

## PEACHES

Four varieties of peaches were tested (Sudanel, Alejandro Dumas, Miraflores and Nectarines).

Similar impact tests were performed on them: 2 to 12 cm drops of the 50.6 gram sphere, completed with Magness-Taylor penetrometer readings and static deformation.

No bruises appear for 2 and 4 cm drops; also higher impacts did not bruise most fruits.

Significant differences, correlated to ripening advancement, were observed for the most relevant impact parameters: max. force, force/deformation slope; total and final times and their difference, with a clear separation of the commercial and non-commercial stage of the tested fruits.

## AVOCADOS

A number of fruits of the variety "Fuerte" were impact-tested with 4 cm drops of the 50,6 gram sphere, during six days of ambient temperature ripening, after cold storage. No bruises were appreciated in most samples; only the very hard fruits showed a small (1-2 mm) void below the skin, with no apparent damaged tissue.

The same impact parameters as described above are being used to determine ripeness advancement, with good separation of 1 or 2 days for individual parameters.

## MANGO AND CHIRIMOJA

Impacts of 4 cm drops of the 50,6gram instrumented sphere produced no bruises in mangoes or chirimojas, during their ambient-temperature ripening periods: twelve days for mangoes, two days for chirimojas.

## PEARS

Impacts with 4 cm drops were applied to two different varieties of pears, as stated above.

Fruits Passa Crassana and Blanquilla varieties were kept during 10 and 12 days of ambient-temperature ripening. Repeated 4 cm impacts were applied to them every day and observation of bruises were done at the end of the testing period.

Passa Crassana seems to be more resistant than the rest of the varieties of pears tested, showing no bruises. Blanquilla variety, already extensively tested in previous years, shows a very small discolored spot, 1-2 mm below the skin.

## STARKING APPLES

Fruits were impact tested (4 cm drops, 50,6 gram mass) during 11 days from a hard commercial stage to complete ripeness or even senescence. All fruits showed bruises at the impacted spots.

## CONCLUSIONS

It is too early to conclude any general statement at this stage of the tests.

We have concluded that these mechanical tests as they are being applied are fast and easy to use, and the information obtained from them gives a good measure of the objectives being searched.

The energy level applied by these small impacts is low, as compared to free-fall of these fruits. The severity of bruise, though, is comparable to this, due to the small

radius of curvature selected for the tester. This applies to fruits of the size of apples, pears, etc, but not for mellons, where comparable drops should be performed with a larger dropping mass.

In relation to bruising susceptibility, it is observed that it is clearly lower in all tested fruits than in apples or in Blanquilla pears.

## REFERENCES

(See other contributions by the same author and co-workers)